REMARKS

Upon entry of the present amendment, the specification will have been amended to replace correct minor informalities in the specification language, replacing the "deletion" with –detection-- phase. Applicants respectfully submit that no prohibited new matter has been entered.

Further, upon entry of the present amendment, claims 1-24 will have been amended to correct informalities in the claim language and to more clearly define the invention, while not substantially affecting or narrowing the scope of these claims. Claims 25 and 26 will have been canceled, without prejudice and without disclaimer of the subject matter. In place of canceled claims 25 and 26, claims 27-29 will have been submitted for the Examiner's consideration, citing essentially the same subject matter, in a form complying with accepted standards and practice before the U.S. Patent and Trademark Office, while not substantially affecting or narrowing the scope of these claims. Applicants respectfully submit that all pending claims are now in condition for allowance.

In the above-referenced Official Action, the Examiner objected to claims 7-24 as being in improper form because of multiple dependent claims 5 and 6. Applicants submit that this objection is moot in view of the preliminary amendments submitted at filing, which eliminated all claim multiple dependencies.

In the above-referenced Official Action, the Examiner rejected claims 1-4, 6, 25 and 26 under 35 U.S.C. § 102(e) as being anticipated by INSELBERG et al. (U.S. Patent No. 5,631,982). The Examiner rejected claim 5 under 35 U.S.C. § 103(a) as being unpatentable over INSELBERG et al. in view of QUEISSER et al. (U.S. Patent No. 5,818,953). Applicants respectfully traverse these rejections, at least for the reasons stated below.

INSELBERG et al. is directed to a system that detects lines using line neighborhoods and a parallel coordinate transformation. More particularly, INSELBERG et al. describe a two-part solution to solve the problem of the inherent ambiguity of line neighborhoods for line detections. The first part is a concept of line neighborhoods to accommodate the uncertainty arising from noise in the image data, and the second part is the introduction of the Cartesian-coordinate to parallel-coordinate transformation to remove the ambiguities of the line neighborhoods. Subsequently, line detection is performed in parallel coordinates. *See* col. 3, lines 5-24.

In the above-referenced Official Action, the Examiner asserted that Figs. 8 and 9 of INSELBERG et al. illustrate the size, length and angles and other features of the line points, and thus teach "extracting multiple features from the collected sample data to represent characteristics of the line points," recited in claim 1 of the present application. However, Fig. 8 of INSELBERG et al. illustrates an example of an image having nineteen line segments, and Fig. 9 illustrates the sampled image of Fig. 8. *See* col. 12, lines 18-22; Fig. 7, step 70. The distance between each pair of image points in Fig. 9 is tested against a predetermined distance threshold range, and the image point pairs that fall within the range are identified. *See* col. 12, lines 22-25; Fig. 7, step 72.

Accordingly, neither Fig. 9 nor the corresponding written description teach or suggest any one of the "multiple features" of the line points. Rather, Fig. 9 shows only sampled points from Fig. 8, and does not provide any features from collected sample data. The only data mentioned with respect to the sample points in Fig. 9 is the distance between pairs of image points, which is the only teaching in this document, since Fig. 9 is merely a "representative sample of the input image data that is of manageable size." *See* col. 10, lines 6-10. Furthermore, there is no disclosure of extracting

features from the sampled data, or of how these features can be used to represent characteristics of the line points.

In contrast, claim 1 recites extracting multiple features from the collected sample data to represent characteristics of the line points. Examples of multiple features include color, line profile, line width and spatial location of the line points, as recited, for example, in claim 7 of the present application. In fact, one advantage of the claimed embodiment of the invention is that, since multiple features of the line points are used as part of the line point detection process, line detection can be performed with a greater degree of accuracy since, during line detection, if one feature measure does not match, then other features can be used for verification. *See, e.g.,* page 15, lines 3-6; page 17, lines 21-23. Such an advantage is not possible with the system of INSELBERG et al. because the distance between sampled points is merely used to cluster the sampled data, and therefore limited to the use of coordinate transformation.

Further, the object of INSELBERG et. al. is to detect line segments in a bitmap of a two-dimensional image in Cartesian coordinates, such as that shown in Fig. 8. Parallel coordinate transform is then introduced to map Cartesian coordinates (instead of points) to a parametric space. The coordinates of the image data depicted, for example, in Fig. 9 are needed to perform the parallel coordinate transform. Consequently, one skilled in the art would not contemplate extracting multiple features from the sampled image data to represent characteristics of the line points, since there is no suggestion of using multiple features in place of the coordinates and this would not give effect to the object. Therefore, Applicants believe that claim 1, and the claims dependent therefrom, are patentably distinguished from INSELBERG et al.

The Examiner rejected independent claims 25 and 26, which have been rewritten as new independent claims 27 and 29 (claim 28 depends from claim 27 to recite one of the elements originally included in claim 25) for essentially the same reasons as claim 1. Accordingly, Applicants respectfully request withdrawal of the rejection for the above reasons.

Moreover, new claim 29, in particular, recites generating prototypes from sample line points of the image, each prototype comprising a cluster of a set of the sample line points having parameters within defined ranges, and detecting line points of the image by comparing image points with the prototypes. Applicants further submit that INSELBERG et al. do not disclose such use of prototypes. Rather, the sample line points of Fig. 8 in INSELBERG et. al. are tested for conformance with predetermined distance criteria. *See* col. 10 lines 14-16; col. 12, lines 22-25. Thereafter, the image point pairs are sorted into two groups based on the distance criteria and mapped to corresponding transform points. *See* col. 11, lines 5-10; Fig. 7, steps 72, 76. Each of the transform points is linked to corresponding neighborhood bins and a bin counter tracks the number of transform points in each bin. *See* Fig. 7, step 82. The bins are scanned horizontally and vertically to locate cluster boundaries, thus creating point clusters. *See* col. 12, lines 55-63; Fig. 7, step 84. These point clusters are then processed, and line detection is performed for the sample line points. *See* col. 12, line 64 – col. 13, line 40. However, there is no disclosure of generating a plurality of prototypes from the sample line points, with each prototype comprising a cluster of line points.

Further, the line points in INSELBERG et al. in each cluster are obtained by transformation of sample points based on parallel coordinates, unlike claim 29, in which the line points are detected from the image by matching image points with the prototypes. The use of prototypes in the claimed

embodiment of the present invention helps to verify if the next candidate point is a line point during line tracing, and thus improves the tracing efficiency. Accordingly, Applicant believes that claim 29 is patentably distinguished from INSELBERG et al. for these additional reasons.

Since INSELBERG et al. do not disclose each and every element of Applicants' claimed embodiment, withdrawal of the rejections of claims 1, 27 and 29, under 35 U.S.C., 102(e) based on INSELBERG et al. is respectfully requested.

With regard to claims 2-23 and 28, Applicants assert that they are allowable at least because they depend, directly or indirectly, from independent claims 1 and 27, respectively, which Applicants submit have been shown to be allowable.

These dependent claims are further allowable based on their respective limitations, which are separately distinguishable over the prior art. For example, with respect to claim 3, the Examiner asserted that Fig. 7 of INSELBERG et. al. illustrates the step of "the line center of each line point is located *prior to* said multiple features being extracted" (emphasis added). However, the center point C is located at step 88 of Fig. 7 (*see* col. 11, lines 41-47), while the extraction step, as asserted by the Examiner, takes place at steps 70 and 72 of Fig. 70. Therefore, even if the Examiner's support for the extraction step were accurate, it is clear that the line center of INSELBERG et al. is located only <u>after</u> the extraction step, and not prior to the extraction step, unlike what is claimed in claim 3 of the present application.

Also, with respect to claim 5, the Examiner relied on QUEISSER et. al., in combination with INSELBERG et al., to teach that the peak of the color ridge profile is the same as the line center. However, QUEISSER et. al. relates to an optical characterization method, particularly to a method of

grading samples with respect to a sample-based color space that corresponds to naturally-occurring color deviations of the samples. Fig. 6 is a flow diagram of a color space conversion process for converting RGB pixel values to corresponding pixel values in a sample-based color space. *See* col. 3, lines 42-44; col. 7, lines 28-30. QUEISSER et al. do not teach or suggest applying the disclosed method to the detection of lines. In contrast, INSELBERG et. al. only relates to detection of lines using Cartesian and parallel coordinate transforms, and do not teach or suggest using color as a feature to represent characteristics of the line points. Consequently, there is no motivation to combine QUEISSER et al. and INSELBERG et al.

Further, process block 106 in QUEISSER et. al. relates to a best fit line 108, preferably a straight line within surface 104, representing distributed HSI pixel values. *See* col. 7, lines 62-65. However, there is no disclosure of locating the center of the line 108 by determining the peak of the color ridge profile of the line at the point location. Therefore, even if there were motivation to combine these references, the combination does not disclose the claimed feature of claim 5. Accordingly, withdrawal of the rejection based on the combination of INSELBERG et al. and QUEISSER et al. is respectfully requested.

In view of the herein contained amendments and remarks, Applicants respectfully request reconsideration and withdrawal of previously asserted rejections set forth in the Official Action of March 8, 2004, together with an indication of the allowability of all pending claims, in due course. Such action is respectfully requested and is believed to be appropriate and proper.

Any amendments to the claims in this Reply, which have not been specifically noted to overcome a rejection based upon the prior art, should be considered to have been made for a purpose unrelated to patentability, and no estoppel should be deemed to attach thereto.

Should the Examiner have any questions concerning this Reply or the present application, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

Respectfully submitted,
Jan Kang WU et al.

Reg. 31,438
for Bruce H. Bernstein
Reg. No. 29,027

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GREENBLUM & BERNSTEIN, P.L.C.
1950 Roland Clarke Place
Reston, VA 20191
(703) 716-1191